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ABSTRACT

The study, based on a survey of agricultural industry in Hawaii, was conducted to obtain current job task information to be used as the basis for curriculum improvement in agricultural technology and ornamental horticulture. It determines the kinds and frequency of job skills and the importance of the accompanying knowledge required. A checklist of job tasks related to agricultural industry was developed along with identified accompanying knowledge. Data were collected on the job tasks being performed, frequency of performance, and an indication of the accompanying knowledge. Personnel from 15 firms were interviewed, and their responses to items on the checklist were recorded. The findings of the study indicate the importance of the following: management activities in agricultural enterprise; equipment usage, maintenance, and repairs; government regulations and policies; agricultural experimentation and research; and processing and marketing of agricultural commodities. Recommendations for the formulation of an agricultural technology and ornamental horticulture curriculum are listed. The major part of the document contains composite summaries of the collected data and a discussion of specific findings for crop and livestock production, nursery and allied services, and landscaping and allied services. A list of participants is appended, and a bibliography is included. (Author/EC)

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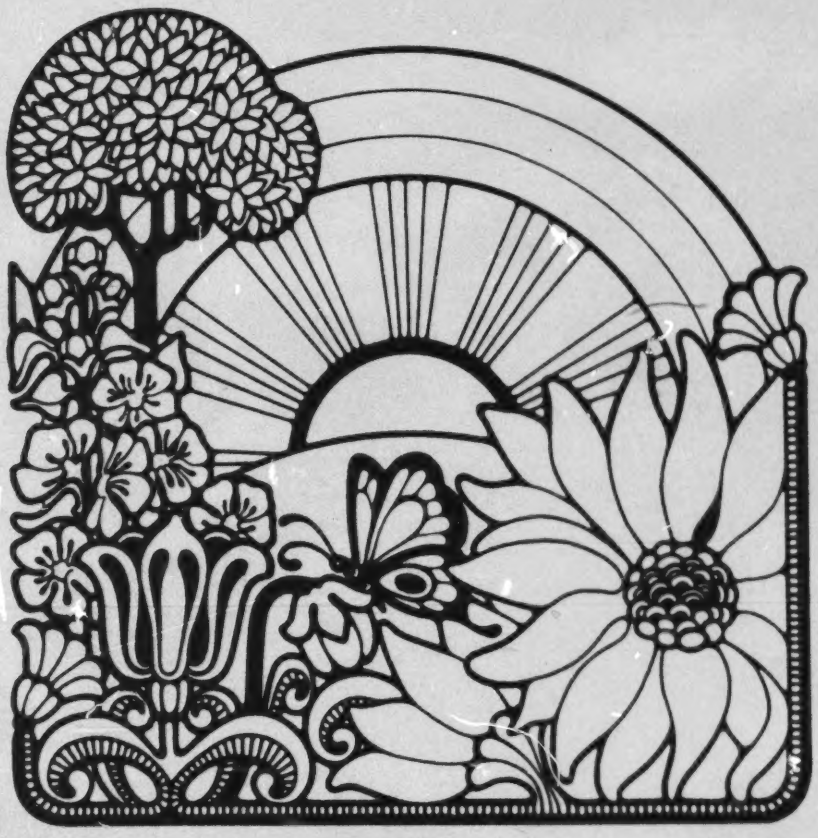

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A FINAL REPORT
ON A PROJECT CONDUCTED UNDER
PROJECT NO. F9006VK
GRANT NO. OEG-9-74-0084

A STUDY OF AGRICULTURAL JOB TASKS AND IMPLICATIONS FOR CURRICULUM DEVELOPMENT IN AGRICULTURE AND AGRICULTURE RELATED OCCUPATIONS

Education Professions Development Act
Part F
Section 553

The project presented or reported herein was performed pursuant to a grant from the U. S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the positions or policy of the U. S. Office of Education, and no official endorsement by the U. S. Office of Education should be inferred.

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Office of Education
National Center for the
Improvement of Educational Systems
Washington, D. C. 20202

PREFACE

Agriculture has been and will continue to be an intrinsic part of Hawaii - part of our lands, our people and our life style.

The intent of Hawaii's leaders is to strengthen the State's agricultural industry to reestablish agriculture as a viable economic base for the state. To realize the state's goal, the education program in Agriculture must be improved and expanded to motivate individuals to consider careers in agriculture.

This report is based on a study of the basic job tasks and knowledge requirements of workers in the agricultural industry in Hawaii. The study was undertaken to determine the curriculum revisions necessary in agricultural education.

The funding source for this study conducted by the State Department of Education, Vocational Technical Education section, was the Special Federal Project (EPDA Part F Section 553) of the Office of the State Director for Vocational Education.

ACKNOWLEDGMENT

This study is the result of the many contributions made by individuals and firms in agriculture and the task forces that gathered the data. The names of individuals and firms that participated in the survey are listed in the Appendix Section. Members of the task forces who conducted the survey through personal interviews are:

Gary Abe - formerly of McKinley High School
David Ikeda - Hawaii Community College
Nobuaki Ikeda - Konawaena High School
Takashi Kajihara - Waimea High School
David Kanemoto - Waipahu High School
Theodore Kawamura - Lahainaluna High School
Ted Kunimitsu - Kahuku High School
Stanley Yoshimoto - Maui High School

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INTRODUCTION

It is imperative that up to date and accurate information about an industry and its activities be the basis for curriculum development in order to equip students with knowledge and skills necessary for employment within that industry. This report is the result of a survey of the agricultural industry in Hawaii.

Purpose of the Study

The purpose of this study was to obtain up to date job tasks information to be used as the basis for curriculum improvement in agriculture. This survey was conducted to determine: (1) the kinds and frequency of job skills, and the importance of the accompanying knowledge required and (2) the job skills that are common to different occupations within the related cluster. The important, as well as common, tasks within a cluster of occupations related to agriculture then would be emphasized in the instructional program in agricultural education; the knowledge required for enabling a worker to perform the specifically identified job tasks would establish the content for agricultural education.

Method of Data Collection

A comprehensive list of possible job tasks related to the agricultural industry was developed by reviewing literature and consulting all reliable sources. A selective list of job tasks appropriate for agriculture in Hawaii was synthesized as a result of this search. The first draft of the list was studied by a panel of judges in agriculture.

A checklist for data gathering was developed, using the selective list of job tasks as a base. For each job task listed, the accompanying knowledge was also identified and listed parallel to each other. The data sought was on the job task being performed, the frequency of performance, and an indication of the importance of the accompanying knowledge. The checklist allowed for additional information as provided by the respondent.

The data collection was conducted through interviews by two groups of four agriculture teachers each, one for Agriculture Technology and another for Ornamental Horticulture. Each member of the two groups interviewed personnel in at least fifteen firms or farms, using the checklist to record the responses.

Limitations of the Study

The limitations of the study are discussed at this point so that the reader may be cognizant of them while interpreting the results of the study.

This study was focused only on the broad kinds of job skills common to related occupations within the agriculture cluster. Resources did not permit a more detailed and comprehensive study of specific job skills of agricultural workers in each specialized field.

Ranking techniques were not used to determine the extent to which one job skill or accompanying knowledge was more important than another. The importance of a job skill or accompanying knowledge was determined by the frequency and indicated importance as reported by the respondents.

Furthermore, this study did not attempt to identify specific job titles within the different occupations in the related cluster.

ASSUMPTIONS

The assumptions accepted by the rssearchers at the beginning of the study were as follows: (1) that agriculture in Hawaii is undergoing many changes; (2) that newer techniques and practices are evolving; and (3) that job tasks and knowledge requirements are changing.

Furthermore the researchers assumed that the four sets of criteria listed below would be acceptable for determining inclusion of job tasks and knowledge in the curriculum.

Percentage Indicating Workers Performing Tasks	
0 - 25%	Job tasks and knowledge requirements represented in this category are performed and required by only a limited number of workers in the industry. These tasks and knowledge requirements may be less emphasized or omitted from the curriculum unless other reasons exist for their inclusion.
26 - 50%	Job tasks and knowledge requirements in this category should be included in the curriculum but given low priority. They may even be excluded if deemed inappropriate for other reasons.
51 - 75%	Job tasks and knowledge requirements in this category are performed and required by a sufficient number of workers to be considered appropriate for inclusion in the curriculum.
76 - 100%	These job tasks and knowledge requirements are deemed important and generally warrant first priority for emphasis in the curriculum. Instructional emphasis on these may or may not always be necessary, especially if they are menial tasks or skills previously acquired by students.

GENERAL SUMMARY OF FINDINGS

Based on the findings of this survey it can be generally concluded that in the agricultural industry of Hawaii job tasks and knowledge requirements for:

1) management activities are important to the success of any agricultural enterprise;

2) equipment usage, maintenance and repairs are important aspects of any agriculture enterprise;

3) implementation of government regulations and policies is vital to the agricultural and ornamental horticulture industries;

4) agricultural experimentation and research are limited and that these activities are carried out in government research centers; and

5) processing and marketing of agricultural commodities are essential.

These findings have direct implications for curriculum development in agricultural education. Improved production methods for crop, livestock and ornamental plants continue to be important but improved processing and marketing methods should also be emphasized. There is also a need to include in the curriculum, basic agricultural management skills.

RECOMMENDATIONS FOR AGRICULTURE TECHNOLOGY CURRICULUM

1. There is a need for greater exposure of equipment and tool usage, care and repair, with options for individualized instruction in specifics according to student interest and need.

2. The various aspects of management such as human relations, finances, plans development, status determination of operations, equipment and supply needs and purchases, market trends and communications should be made familiar to students.

3. Since government regulations affect production, processing and distribution of agricultural commodities, it would be well to expose students to these regulations. Heavy emphasis should be placed on safety, pesticide usage, grades and standards, and environmental control.

4. Some exposure to interpreting research findings and conducting varietal trials and time-cost studies should be made in the curriculum.

5. Positive attitudes should be stressed throughout the entire course of study.

6. Agriculture terminology needs to be stressed for improving communication.

7. Since growth and development of crop plants are basic to agriculture, units of instruction in field preparation, irrigation and irrigation systems, fertilization, identification and control of pests, and harvesting should have high priority and heavy emphasis in the Agriculture Technology course of study.

8. Basic to livestock production are feeding, pest control, and facilities maintenance and repair. These, therefore, should also be heavily emphasized in the Agriculture Technology course of study.

9. Maintaining, sanitation, grading and packing, preparing commodities for shipping and selling of commodities should be stressed in the curriculum.

10. In view of growing concerns for the environment, animal waste disposal in livestock production should be stressed in the course of study.

11. Instruction in crop and livestock growth and development should reflect industry's techniques and practices; contacts with industry should be on a regular basis.

RECOMMENDATIONS FOR ORNAMENTAL HORTICULTURE CURRICULUM

1. While continued emphasis should be on various aspects of plant growth and development, particular emphasis should be made to irrigating plants.

2. Management practices and principles such as human relations, development of plans, status determination of operation, equipment and supply purchases, communication, marketing trends, promotion, finance and budget need to be stressed.

3. Government regulations affecting ornamental horticulture such as safety, pesticides and environmental controls should be stressed throughout the course of study.

4. Greater emphasis should be placed on the use, care and repair of hand tools, equipment and machines. Instruction should also include specialized equipment wherever possible.

5. Produce usage and care of plants should be heavily stressed in the curriculum because of the requests by customers of such information.

6. Preparing flowers, shrubs, and foliage, and potted plants for distribution are important aspects of ornamental horticulture and should have proper emphasis in the Ornamental Horticulture course of study.

7. Students should be exposed to reading and interpreting research findings, identifying problems requiring research and controlling plant environment.

8. Basic to landscaping and groundskeeping are setting plants according to plan, correcting drainage, use of special equipment and maintaining lawns and turf. These should have proper emphasis in the curriculum.

9. The Ornamental Horticulture course of study should reflect as much as possible industry's practices and techniques; contacts with industry should be on a regular basis.

DISPLAY AND ANALYSIS OF SURVEY DATA

The data as presented showing high or low percentage of workers performing tasks and the high or low percentage of people reporting the importance of knowledge would generally indicate the need for inclusion or omission in the curriculum. However there are special instances where other factors must be considered. Hence, further analysis was made on those items that needed clarification. For example, certain job skills reported in the composite summaries as low (because of a small number of workers involved) was found to be important and therefore marked for inclusion in the curriculum since they are specialty tasks assigned to only a few workers. Conversely certain job skills reported by a high percentage of respondents do not necessarily mean that those particular skills should be incorporated in the curriculum because they are menial tasks requiring no special instruction.

In this section are included composite summaries of data followed by the specific findings of the survey, and a report on further clarification of the survey data and findings in Agriculture Technology and Ornamental Horticulture.

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE

REQUIREMENTS OF AGRICULTURE TECHNOLOGY

RELATED TO:

CROP PRODUCTION

LIVESTOCK PRODUCTION

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF AGRICULTURE TECHNOLOGY RELATED TO CROP PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 43 — PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		RELATED KNOWLEDGE REQUIREMENT
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT									
1. Prepares field for planting				X	36	61	89	6	1. Soils & Soil Preparation
2. Seeds and grows seedlings			X		27	45	79		2. Seedling Culture
3. Transplants crop plants			X		9	58	70		3. Principles of Transplanting
4. Reproduces plants by grafting, layering	X				11	12	24		4. Grafting & Layering
5. Breeds plants	X					6	19		5. Genetics, Plant Anatomy
6. Irrigates crop plants				X	85	6	88	12	6. Irrigation & Irrigation Systems
7. Applies different fertilizers				X	39	55	94	6	7. Plant Nutrition
8. Mixes and applies insecticides safely				X	58	21	85		8. Insect Ident. & Control
9. Mixes and applies herbicides safely				X	39	52	94	6	9. Weed Ident. & Control
10. Mixes and applies fungicides safely			X		42	15	80		10. Disease Ident., Prevention & Control
11. Mixes and applies miticides safely			X		30	21	71		11. Mite Ident. & Control
12. Sterilizes soil		X				27	52		12. Soil Sterilants
13. Prevents soil erosion			X		27	57	93	3	13. Conservation Practices
14. Harvest crops				X	76	21	97	3	14. Harvesting Techniques
15. Corrects drainage problems		X			6	33	57		15. Soil Drainage
16. Constructs and repairs crop growing facilities									16. Construction Techniques
a. greenhouse	X				15		15		a. Greenhouse materials & supplies
b. mist system	X					6	3		b. Mist system materials & supplies
c. trellises		X				36	43		c. Trellising materials & supplies
d. plant box and trench	X					24	21		d. Plant box and trench mat. & sup.
e. windbreaks	X					18	20		e. Windbreak materials & supplies

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF AGRICULTURE TECHNOLOGY RELATED TO CROP PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 43						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT (Continued)									
Others (List) Farm buildings						3	3		
Irrigation systems						24	21		
B. ANIMAL GROWTH AND DEVELOPMENT									
1. Feeds livestock (cattle, swine or poultry)									1. Feeds & Feeding
2. Assists in the delivery of newborn animals									2. Care of Animal Young
3. Alters livestock by castration									3. Castration
4. Maintains livestock Health									4. Veterinary Principles
a. insect and mite control									a. Insect & mite ident. & control
b. injury treatment									b. First-Aid
c. disease prevention and control									c. Anti-biotics
d. sanitation									d. Sanitation
5. Maintains pasture									5. Pasture Management
6. Maintains and repairs facilities									6. Facilities Maintenance
7. Maintains breeding herd									7. Breed Herd Management
8. Records breeding									8. Breeding Records/Gestation
Others (List)									
C. EQUIPMENT USAGE AND MAINTENANCE									
Equipment Usage									

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF AGRICULTURE TECHNOLOGY RELATED TO CROP PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 43 — PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		RELATED KNOWLEDGE REQUIREMENT — PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
C. EQUIPMENT USAGE AND MAINTENANCE									
Equipment Usage (Continued)									
1. Operates tractor and tillage equipment.				X	57	36	99		1. Operation & Care of Tractor & Attach.
2. Uses planter		X			12	18	27		2. Operation & Care of Planter
3. Uses fertilizer spreader		X			15	21	36		3. Operation & Care of Fert. Spreader
4. Operates small truck				X	100		100		4. Operation & Care of Small Truck
5. Uses power sprayer				X	72	17	95		5. Operation & Care of Power Sprayer
6. Use oxy-acetylene equipment			X		18	46	73		6. Operation & Care of Oxy-Acet. Equip.
7. Uses sterilizing equipment	X				5	6	11		7. Operation & Care of Sterilizing Equip
8. Operates heavy equipment-bulldozer, grader--		X			21	15	39		8. Operation & Care of Heavy Equipment
9. Uses construction equipment	X				3	15	18		9. Operation & Care of Constr. Equip.
10. Operates heavy truck			X		47	6	53		10. Operation & Care of Heavy Truck
11. Uses electric arc welding equip.			X		18	38	63		11. Operation & Care of Arc Weld. Equip.
12. Uses dairying equipment									12. Operation & Care of Dairy Equipment
13. Uses poultry equipment									13. Operation & Care of Poultry Equip.
14. Uses swine equipment									14. Operation & Care of Swine Equipment
15. Uses meat cutting equipment									15. Operation & Care of Meat Cut. Equip.
16. Uses hand tools				X	69	18	87		16. Use and Care of Hand Tools
17. Uses portable power equipment			X		20	55	69		17. Use and Care of Portable Power Equip.
18. Uses farm level		X			9	30	55		18. Use and Care of Farm Level
Others (List) Scientific equipment					3		3		

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF AGRICULTURE TECHNOLOGY RELATED TO CROP PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 43						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
C. EQUIPMENT USAGE AND MAINTENANCE (Cont)									
Equipment Maintenance									
19. Services and maintains equipment				X	45	45	91		19. Servicing and Maintenance of Equip.
20. Repairs broken equipment and machinery				X	27	59	90		20. Repair Parts/ Metal Fusion Process
21. Cleans and sterilizes equipment		X			27	21	39		21. Sanitation
22. Assembles machinery and equipment		X			11	29	65		22. Machine and Equipment Assembly
23. Recondition hand tools				X	29	60	89		23. Hand Tool Reconditioning
24. Overhauls engines		X			9	25	31		24. Overhauling
Others (List) Specialized equip.					3	6	9		
D. PROCESS, MARKET AND DISTRIBUTE COMMODITIES									
1. Prepares livestock and/or poultry for market									1. Shipping Equipment & Procedures
2. Slaughters livestock and/or poultry									2. Slaughtering Regulations & Procedures
3. Cleans, grades and packs commodities				X	81	3	84		3. Grades & Standards
4. Ships commodities				X	81	3	84		4. Shipping Procedures
5. Receives, processes and stores commodities		X			29	3	32		5. Receiving & Stock Control
6. Repacks commodities for retail delivery	X				17		20		6. Packaging

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF AGRICULTURE TECHNOLOGY RELATED TO CROP PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 43						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
D. PROCESS, MARKET AND DISTRIBUTE COMMODITIES (Continued)									
7. Takes order and arranges for delivery			X		60	3	63		7. Sales and Services
8. Uses sales techniques		X			29	3	37		8. Sales and Services
9. Displays commodities	X				14		14		9. Display
10. Maintains sanitation			X		77		79		10. Sanitation Regulations
11. Cuts meat									11. Meat Cuts
12. Cuts pork									12. Pork Cuts
13. Cuts poultry									13. Poultry Cuts
14. Processes farm produce			X		55		55		14. Food Processing Regulations
Others (List) Clean, shell & bag seed					3	3	6		
E. TECHNOLOGY AND RESEARCH									
1. Conducts plant varietal trials			X		15	36	55		1. Experimental Procedures/ Genetics
2. Conducts breed trials									2. Experimental Procedures/ Genetics
3. Conducts agricultural chemical trials		X			8	27	35		3. Experimental Procedures/Chemistry
4. Adapts equipment to peculiar needs		X			9	33	57		4. Mechanical Engineering
5. Carries out time cost studies			X		25	39	67		5. Cost Accounting
6. Keeps records of trials and experiments			X		29	26	56		6. Data and Records
7. Identifies problems requiring research		X			12	38	57		7. Observation & Identification of Prob
8. Diagrams and designs facilities	X				21		24	3	8. Architectural & Mechanical Drawing

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF AGRICULTURE TECHNOLOGY RELATED TO CROP PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 43 — PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		RELATED KNOWLEDGE REQUIREMENT
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
E. TECHNOLOGY AND RESEARCH (Continued)									
9. Reads and interprets research findings			X		27	40	74		9. Interpretation of Data
10. Reads and interprets technical manuals			X		27	43	71		10. Technical Vocabulary
11. Writes reports		X			15	25	40		11. Report Writing
12. Interprets land survey maps		X			21	21	42		12. Land Survey and Map
13. Controls environment in which crops are grown		X			33	15	55		13. Environmental Aspects of Crops
14. Controls environment in which livestock kept									14. Environmental Aspects of Livestock
15. Disposes of agricultural and waste		X			34	21	59		15. EPA Regulations
Others (List) Records for planting					3		6		
F. MANAGEMENT AND FINANCES									
1. Promotes good human relations				X	77	3	100		1. Human Relations
2. Develops operational plans				X	73	15	98		2. Planning
3. Develops budget				X	3	75	87		3. Budgeting
4. Determines status of operations				X	55	37	94		4. Evaluation
5. Prepares financial statements				X	18	61	78		5. Accounting
6. Studies market trends				X	48	36	73	3	6. Market Research
7. Promotes new markets and outlets			X		30	21	51	3	7. Marketing
8. Communicates with outlets				X	43	28	72	3	8. Sales and Services
9. Arranges for loans			X		61	11	72	3	9. Loans and Loan Procedures

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF AGRICULTURE TECHNOLOGY RELATED TO CROP PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 43						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
F. MANAGEMENT AND FINANCES									
10. Prepares and/or interprets contracts		X			3	35	56		10. Business Law
11. Advertises products	X				7	14	22		11. Advertising
12. Prepares bids	X					16	16		12. Contracts
13. Files necessary tax reports				X	6	74	82	3	13. Tax Regulations/ Filing Procedures
14. Interviews and hires workers				X	6	73	93	3	14. Personnel Procedures
15. Decides on equipment and supply purchases				X	30	58	85		15. Money Management
16. Keeps employee records				X	67	15	82		16. Record Keeping
17. Studies and implements government regulations									17. Government Regulations
a. pesticide usage				X	52	36	88		a. Pesticide regulations
b. standards and grades				X	48	42	88		b. Standards and grades
c. OSHA standards				X	40	50	93		c. OSHA regulations
d. employee benefits				X	31	50	80		d. Employee benefits
e. zoning			X			54	59		e. Zoning regulations
f. environmental concerns				X	31	52	95		f. EPA regulations
Others (List)									

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE AGRICULTURAL INDUSTRY RELATED TO LIVESTOCK PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 26 — PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		RELATED KNOWLEDGE REQUIREMENT — PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT									
1. Prepares field for planting	X					19	29		1. Soils & Soil Preparation
2. Seeds and grows seedlings	X					14	19		2. Seedling Culture
3. Transplants crop plants	X					19	19		3. Principles of Transplanting
4. Reproduces plants by grafting, layering									4. Grafting & Layering
5. Breeds plants									5. Genetics, Plant Anatomy
6. Irrigates crop plants	X				14	5	19		6. Irrigation & Irrigation Systems
7. Applies different fertilizers		X				29	29		7. Plant Nutrition
8. Mixes and applies insecticides safely	X				5	14	24		8. Insect Ident. & Control
9. Mixes and applies herbicides safely	X				5	14	19		9. Weed Ident. & Control
10. Mixes and applies fungicides safely							19		10. Disease Ident., Prevention & Control
11. Mixes and applies miticides safely							5		11. Mite Ident. & Control
12. Sterilizes soil							5		12. Soil Sterilants
13. Prevents soil erosion	X				5	10	24		13. Conservation Practices
14. Harvest crops	X				19		19		14. Harvesting Techniques
15. Corrects drainage problems							9		15. Soil Drainage
16. Constructs and repairs crop growing facilities									16. Construction Techniques
a. greenhouse									a. Greenhouse materials & supplies
b. mist system									b. Mist system materials & supplies
c. trellises							5		c. Trellising materials & supplies
d. plant box and trench									d. Plant box and trench mat. & sup.
e. windbreaks							5		e. Windbreak materials & supplies

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE AGRICULTURAL INDUSTRY RELATED TO LIVESTOCK PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 26						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT (Continued)									
Others (List) Irrigation					5		5		
B. ANIMAL GROWTH AND DEVELOPMENT									
1. Feeds livestock (cattle, swine or poultry)				X	86	14	81	19	1. Feeds & Feeding
2. Assists in the delivery of newborn animals			X		29	29	62		2. Care of Animal Young
3. Alters livestock by castration			X		10	57	67		3. Castration
4. Maintains livestock Health									4. Veterinary Principles
a. insect and mite control				X	48	43	95		a. Insect & mite ident. & control
b. injury treatment		X			19	24	76		b. First-Aid
c. disease prevention and control				X	43	52	95		c. Anti-biotics
d. sanitation				X	86	9	95	5	d. Sanitation
5. Maintains pasture		X			29	14	43	10	5. Pasture Management
6. Maintains and repairs facilities				X	67	29	95	5	6. Facilities Maintenance
7. Maintains breeding herd			X		52	14	67		7. Breed Herd Management
8. Records breeding			X		43	10	67		8. Breeding Records/Gestation
Others (List) (Hospital Inventory, brood chicks) Milk cows, collect eggs					24		29		
C. EQUIPMENT USAGE AND MAINTENANCE									
Equipment Usage									

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE AGRICULTURAL INDUSTRY RELATED TO LIVESTOCK PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 26						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
C. EQUIPMENT USAGE AND MAINTENANCE									
Equipment Usage (Continued)									
1. Operates tractor and tillage equipment.			X		63	5	68		1. Operation & Care of Tractor & Attach.
2. Uses planter	X					10	10		2. Operation & Care of Planter
3. Uses fertilizer spreader	X					10	10		3. Operation & Care of Fert. Spreader
4. Operates small truck				X	100		100		4. Operation & Care of Small Truck
5. Uses power sprayer			X		19	33	52	5	5. Operation & Care of Power Sprayer
6. Use oxy-acetylene equipment				X	49	29	82		6. Operation & Care of Oxy-Acet. Equip.
7. Uses sterilizing equipment			X		49	5	54		7. Operation & Care of Sterilizing Equip
8. Operates heavy equipment-bulldozer, grader--		X			38	5	48		8. Operation & Care of Heavy Equipment
9. Uses construction equipment	X				5	10	14		9. Operation & Care of Constr. Equip.
10. Operates heavy truck			X		67	14	82		10. Operation & Care of Heavy Truck
11. Uses electric arc welding equip.			X		39	29	77		11. Operation & Care of Arc Weld. Equip.
12. Uses dairying equipment	X				22		22		12. Operation & Care of Dairy Equipment
13. Uses poultry equipment		X			24		24		13. Operation & Care of Poultry Equip.
14. Uses swine equipment		X			33		33		14. Operation & Care of Swine Equipment
15. Uses meat cutting equipment	X				13	10	18	5	15. Operation & Care of Meat Cut. Equip.
16. Uses hand tools				X	75	14	89		16. Use and Care of Hand Tools
17. Uses portable power equipment	X				5		10		17. Use and Care of Portable Power Equip.
18. Uses farm level									18. Use and Care of Farm Level
Others (List)									

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE AGRICULTURAL INDUSTRY RELATED TO LIVESTOCK PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 26						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
C. EQUIPMENT USAGE AND MAINTENANCE (Cont)									
Equipment Maintenance									
19. Services and maintains equipment				X	75	24	99		19. Servicing and Maintenance of Equip.
20. Repairs broken equipment and machinery				X	42	43	95		20. Repair Parts/ Metal Fusion Process
21. Cleans and sterilizes equipment			X		54	19	73		21. Sanitation
22. Assembles machinery and equipment			X		10	51	65		22. Machine and Equipment Assembly
23. Recondition hand tools			X		14	38	62		23. Hand Tool Reconditioning
24. Overhauls engines		X			5	44	48		24. Overhauling
Others (List)									
D. PROCESS, MARKET AND DISTRIBUTE COMMODITIES									
1. Prepares livestock and/or poultry for market			X		33	19	48	5	1. Shipping Equipment & Procedures
2. Slaughters livestock and/or poultry		X			41	9	51		2. Slaughtering Regulations & Procedures
3. Cleans, grades and packs commodities			X		49	9	58		3. Grades & Standards
4. Ships commodities		X			25	23	49		4. Shipping Procedures
5. Receives, processes and stores commodities	X				25		25		5. Receiving & Stock Control
6. Repacks commodities for retail delivery	X				12		12		6. Packaging

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE AGRICULTURAL INDUSTRY RELATED TO LIVESTOCK PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 20						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
D. PROCESS, MARKET AND DISTRIBUTE COMMODITIES (Continued)									
7. Takes order and arranges for delivery			X		66	9	71	5	7. Sales and Services
8. Uses sales techniques		X			48		48		8. Sales and Services
9. Displays commodities		X			29		29		9. Display
10. Maintains sanitation				X	76		77		10. Sanitation Regulations
11. Cuts meat	X				4		4		11. Meat Cuts
12. Cuts pork	X				5		5		12. Pork Cuts
13. Cuts poultry	X				14		14		13. Poultry Cuts
14. Processes farm produce	X				16		12		14. Food Processing Regulations
Others (List) Process milk, juice					14		14		
E. TECHNOLOGY AND RESEARCH									
1. Conducts plant varietal trials	X				10	5	14		1. Experimental Procedures/ Genetics
2. Conducts breed trials			X		10	42	42		2. Experimental Procedures/ Genetics
3. Conducts agricultural chemical trials		X			10	24	37		3. Experimental Procedures/Chemistry
4. Adapts equipment to peculiar needs		X			5	37	41		4. Mechanical Engineering
5. Carries out time cost studies				X	29	47	77		5. Cost Accounting
6. Keeps records of trials and experiments			X		24	46	70		6. Data and Records
7. Identifies problems requiring research			X		5	59	63		7. Observation & Identification of Prob.
8. Diagrams and designs facilities		X				50	50		8. Architectural & Mechanical Drawing

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE AGRICULTURAL INDUSTRY RELATED TO LIVESTOCK PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 26 — PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		RELATED KNOWLEDGE REQUIREMENT — PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
E. TECHNOLOGY AND RESEARCH (Continued)									
9. Reads and interprets research findings				X	23	58	82		9. Interpretation of Data
10. Reads and interprets technical manuals			X		14	57	77		10. Technical Vocabulary
11. Writes reports			X		10	43	53		11. Report Writing
12. Interprets land survey maps	X					19	19		12. Land Survey and Map
13. Controls environment in which crops are grown	X				14		10		13. Environmental Aspects of Crops
14. Controls environment in which livestock kept				X	61	20	82		14. Environmental Aspects of Livestock
15. Disposes of agricultural and waste				X	61	22	84		15. EPA Regulations
Others (List)									
F. MANAGEMENT AND FINANCES									
1. Promotes good human relations				X	100		100		1. Human Relations
2. Develops operational plans				X	71	24	100		2. Planning
3. Develops budget				X	5	71	95		3. Budgeting
4. Determines status of operations				X	57	43	90		4. Evaluation
5. Prepares financial statements				X	24	62	81		5. Accounting
6. Studies market trends				X	52	28	86		6. Market Research
7. Promotes new markets and outlets			X		19	53	67		7. Marketing
8. Communicates with outlets				X	48	48	96		8. Sales and Services
9. Arranges for loans			X			56	56		9. Loans and Loan Procedures

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE AGRICULTURAL INDUSTRY RELATED TO LIVESTOCK PRODUCTION

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 26						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE KNOWLEDGE		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
F. MANAGEMENT AND FINANCES									
10. Prepares and/or interprets contracts		X				48	48		10. Business Law
11. Advertises products		X			10	33	44		11. Advertising
12. Prepares bids	X					12	18		12. Contracts
13. Files necessary tax reports				X	5	81	86		13. Tax Regulations/ Filing Procedures
14. Interviews and hires workers				X	5	86	90		14. Personnel Procedures
15. Decides on equipment and supply purchases				X	24	74	99		15. Money Management
16. Keeps employee records				X	61	38	95		16. Record Keeping
17. Studies and implements government regulations									17. Government Regulations
a. pesticide usage				X	29	66	95		a. Pesticide regulations
b. standards and grades				X	41	46	91		b. Standards and grades
c. OSHA standards				X	24	74	99		c. OSHA regulations
d. employee benefits				X	10	81	99		d. Employee benefits
e. zoning		X				33	38		e. Zoning regulations
f. environmental concerns				X	19	71	90		f. EPA regulations
Others (List)									

Specific Findings of the Survey in Agriculture Technology

The following focuses attention on the specific findings of the survey of job tasks and knowledge requirements in the agricultural industry related to: (1) crop production and (2) livestock production.

A. Crop Production

1. In plant growth and development, the respondents ranked preparing the field for planting, irrigating crops, applying fertilizer, applying insecticides and herbicides and harvesting crops as very important.

2. With regard to equipment and machine usage, operating tractor and tillage equipment, power sprayer and using hand tools ranked very high.

3. Servicing, maintaining and repairing equipment and reconditioning hand tools were considered very important job tasks.

4. With regard to processing, marketing, and distribution, the respondents indicated cleaning, grading, packing and shipping commodities as very important. Others rated important were taking orders and arranging delivery, maintaining sanitation and processing farm produce.

5. Reading and interpreting research findings and technical manuals, keeping records of trials and experiments, conducting plant varietal trials, and conducting time-cost studies were deemed important by respondents of the survey.

6. The management activities were ranked high by the industry. Promoting good human relations, developing a budget, developing operational plans, determining status of operations, preparing financial statements, studying market trends, deciding on equipment, and supply purchases, were deemed very important.

7. Adhering to government regulations in pesticide usage, standards and grades, and environmental concerns were indicated to be important.

8. Though not listed in the survey instrument, many respondents mentioned positive attitude towards work as important.

B. Livestock Production

1. In animal growth and development, feeding of livestock was ranked the highest. Other job tasks deemed very important were pest control, sanitation and facilities maintenance and repair.

2. All respondents listed as necessary operating and using power equipment and tools. Using welding equipment and hand tools were ranked very high by respondents.

3. Servicing, maintaining and repairing equipment were also deemed very important.

4. Maintenance of sanitation was ranked most important by processors of livestock. Others considered important include preparing livestock and/or poultry for market, cleaning, grading and packing and taking orders and arranging deliveries.

5. Carrying out time-cost studies, controlling the environment in which livestock are kept, reading and interpreting research findings and disposing of livestock waste were key activities in the application of technology and research.

6. In management and finances, livestock production personnel indicated promoting good human relations as the most important task. Other very important tasks were: developing operational plans, developing a budget, determining status of operation, preparing financial statements, studying market trends, communicating with outlets and deciding on equipment and supply purchases.

7. Following government regulations pertaining to safety, grades and standards, pesticides and environmental control were considered very important by respondents.

C. Further Clarification of Survey Data and Findings in Agriculture Technology

Certain items in the Composite Summaries of Job Tasks and Knowledge Requirements of Agriculture Technology related to crop and livestock production require further clarification for possible implications for curriculum revision.

The composite summary for crop production is a compilation of responses from 33 crop growers (truck crop, fruits, nuts, sugar) and 10 produce processors while the livestock production summary included responses from 21 livestock growers (beef, dairy, swine and poultry) and 5 livestock product processors.

The low percentages of workers performing job skills such as reproducing plants by grafting and layering, constructing and repairing crop growing facilities, and sterilizing soil does not necessarily mean that these job skills are unimportant, but that these are specialized job skills requiring few skilled workers (e. g. fruit and nut growers). Similarly the use of specialized equipment especially in the processing of agricultural commodities require fewer workers possessing certain specialized skills.

Although the reported percentage of workers performing tasks related to pasture management was low, the tasks are nevertheless considered vital to the total operations for dairy and beef cattle which rely wholly or substantially on pasturage to maintain animals.

The very high percentage of workers reported operating a small vehicle in the industry does not necessarily mean that a heavy emphasis should be made in teaching motor vehicle operational skills. More important is the preventive maintenance skills that should be stressed.

An unsolicited response of significance was the inclusion of irrigation systems by 24% of the crop production respondents. This response is perhaps due to the growing use of improved systems such as drip and sprinkler irrigation by the respondents.

Wherever possible skills using specialized equipment should be included in the high school curriculum. However, this does not mean that the high school agriculture program should duplicate specialized equipment found in industry to carry out its instruction. Other innovations such as cooperative agricultural education and work experience in agriculture should be provided those students seeking specialized skills.

There seemed to be some importance attached to research activities by crop and livestock production respondents. Crop production respondents indicated carrying out varietal trials, carrying out time-cost studies, keeping records of trials and experiments and reading and interpreting research findings as part of the overall operations. Livestock production respondents felt the need for carrying out time-cost studies, keeping records of trials and experiments, identifying problems requiring research and reading and interpreting research findings. In terms of the high school agriculture program, research and experimentations should be kept to a minimum for time and facilities preclude such undertakings.

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE

REQUIREMENTS OF ORNAMENTAL HORTICULTURE

RELATED TO:

NURSERY AND ALLIED SERVICES

LANDSCAPING AND ALLIED SERVICES

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO NURSERY AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 60						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT									
1. Prepares soil and/or media			X		21	42	61	7	1. Soils and Plant Media
2. Sows seeds and grows seedlings			X		23	30	43	11	2. Seedling Culture
3. Transplants plants			X		38	33	66	5	3. Principles of Transplanting
4. Pots plants		X			41	7	43	5	4. Potting and Plant Culture
5. Makes pots	X				2	2	3	13	5. Pot Making Materials & Techniques
6. Reproduces plants vegetatively		X			28	15	46	9	6. Vegetative Propagation
7. Identifies and applies different fertilizers			X		31	35	66	5	7. Plant Nutrition
8. Irrigates plants			X		32	31	67	9	8. Irrigation and Irrigation Systems
9. Mixes and applies herbicides safely			X		17	38	56	4	9. Weed Identification & Control
10. Mixes and applies insecticides safely			X		38	28	67	4	10. Insect Identification & Control
11. Mixes and applies miticides safely			X		31	30	61	4	11. Mite Identification & Control
12. Mixes and applies fungicides safely			X		31	29	60	4	12. Disease Ident., Prevention & Control
13. Mixes and applies growth regulators safely	X				5	16	22	15	13. Growth Regulators
14. Selects and grows Horticultural plants		X			17	19	40	8	14. Plant Identification & Culture
15. Selects and grows lawns and turf	X					5	5		15. Turf Grass Identification and Culture
16. Sterilizes soil and/or media		X			7	20	25	15	16. Soil Sterilants
17. Mows lawn and turf	X				3	2	15	13	17. Lawn and Turf Maintenance
18. Prunes trees, shrubs and flowers			X		28	13	45	6	18. Pruning Methods and Plant Growth
19. Trains plants	X				5	7	11	23	19. Bonsai, Topiary
20. Corrects drainage problems		X			5	27	37	12	20. Soil Drainage

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO NURSERY AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 60								RELATED KNOWLEDGE REQUIREMENT
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT (continued)									
21. Sets plants according to plan	X				7	6	16	12	21. Landscape Plan and Design
22. Prepares container plants		X			23	7	31	5	22. Container Plant Culture
23. Constructs and repairs growing facilities									23. Construction & Maint. of Facilities
a. greenhouse		X			10	20	31	5	a. greenhouse materials & supplies
b. mist system		X			5	29	28	6	b. Mist system materials & supplies
c. bench		X			8	18	23	5	c. Bench materials and supplies
Others(List)									
B. EQUIPMENT USAGE AND MAINTENANCE									
1. Operates tractor and attachments		X			15	13	34	16	1. Operation & Care of Tractor & Attach.
2. Uses power sprayer		X			33	11	46	8	2. Operation & Care of Power Sprayer
3. Uses portable power tools		X			19	20	41	7	3. Operation & Care of Port. Power Tools
4. Operates small truck				X	62	14	78	6	4. Operation & Care of Small Truck
5. Uses sterilizing equipment	X				8	7	16	16	5. Operation & Care of Sterilizing Equip
6. Uses concrete mixer					2	9	10	12	6. Operation & Care of Concrete Mixer
7. Uses shredder	X				7	7	14	14	7. Operation & Care of Shredder
8. Uses chain saw	X				3	18	24	14	8. Operation & Care of Chain Saw
9. Uses mower	X				9	9	18	8	9. Operation & Care of Mower
10. Uses proportioner	X				12	7	16	18	10. Operation & Care of Proportioner
11. Uses hand tools			X		61	5	68		11. Uses & Care of Hand Tools
12. Uses tree planting equipment	X				5		5	5	12. Operation & Care-Tree Plant. Equip.

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO NURSERY AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 60						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
B. EQUIPMENT USAGE AND MAINTENANCE (continued)									
13. Uses small gas engines	X				12	2	14	10	13. Operation & Care of Small Engines
Others (List) Staple					9		2		
Welder					3		3		
Fork Lift					2		2		
Equipment maintenance									
14. Services and maintains equipment			X		17	37	53	5	14. Servicing & Maintenance of Equip.
15. Repairs broken equipment and machinery		X			7	28	38	7	15. Repair Parts/Disassembly
16. Reconditions hand tools			X		11	29	38	8	16. Hand Tools Reconditioning
Others (List) Refrigerator					7		7		
C. PROCESS, MARKET AND DISTRIBUTE COMMODITIES									
1. Prepares flowers, foliage shrubs for market				X	81	4	85	7	1. Plant Material Handling
2. Prepares floral pieces for all occasions		X			30	4	34	18	2. Floral Arrangement
3. Takes orders and arranges for delivery				X	82	5	88	2	3. Sales and Service
4. Grades flowers and foliage			X		50	7	58	3	4. Grades and Standards
5. Stores horticultural supplies				X	47	33	80	3	5. Stock Control
6. Stores flowers and foliage		X			62	7	66	6	6. Post Harvest Handling

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO NURSERY AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 60						RELATED KNOWLEDGE REQUIREMENT	
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK	
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important
C. PROCESS, MARKET AND DISTRIBUTE COMMODITIES (Continued)								
7. Sells flowers, floral arrangement and prod.			X		72	3	73	3
8. Advises customers on product usage			X		63	12	75	5
9. Advises customers on care of plants				X	55	22	73	5
10. Displays flower and foliage		X			30	14	44	10
Others (List)								
Fabrication of boxes						2	2	
D. TECHNOLOGY AND RESEARCH								
1. Carries out plant varietal trials	X				8	12	25	8
2. Carries out agricultural chemical trials	X				5	14	20	8
3. Adapts equipment to peculiar needs	X				5	10	20	5
4. Carries out time-cost studies	X				9	15	25	5
5. Identifies problems requiring research		X			11	15	26	
6. Keeps records of experiments and trials		X			18	12	30	5
7. Writes reports	X				2	14	21	5
8. Diagrams and designs facilities	X				3	12	19	4
9. Reads and interprets research findings	X				9	12	22	5

KNOWLEDGE
7. Salesmanship
8. Product Usage
9. Plant Culture
10. Display Techniques
1. Experimental Procedures/Genetics
2. Experimental Procedures/Chemistry
3. Mechanical Engineering
4. Cost Accounting
5. Observation & Identification of Prod
6. Data & Records
7. Report Writing
8. Architectural Drawing
9. Interpretation of Data

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO NURSERY AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 60								RELATED KNOWLEDGE REQUIREMENT
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
D. TECHNOLOGY AND RESEARCH (Continued)									
10. Reads and interprets technical manuals		X			12	15	27	5	10. Technical Vocabulary
11. Breeds plants	X				2	4	9	8	11. Genetics
12. Controls environment in which plants grow		X			10	12	26	2	12. Environmental Aspects of Plants
Others (List) Tissue trial						2	2		
visitation							2		
post harvest trial						2	2		
E. MANAGEMENT AND FINANCES									
1. Promotes good human relations				X	87	7	94		1. Human Relations
2. Develops operational plans				X	51	32	83	2	2. Planning
3. Develops budget			X		24	39	66	3	3. Budgeting
4. Determines status of operations				X	58	23	80	2	4. Evaluation
5. Prepares financial statements			X		28	43	71	6	5. Accounting
6. Studies market trends			X		31	32	64	7	6. Market Research
7. Promotes new markets and outlets			X		39	20	62	7	7. Marketing
8. Communicates with outlets			X		52	21	78	5	8. Sales and Services
9. Arranges for loans		X				37	47	7	9. Loans and Loan Procedures
10. Prepares and/or interprets contracts		X			5	25	30	7	10. Business Law
11. Advertises products		X			22	12	34	10	11. Advertising
12. Prepares bids	X					10	10	13	12. Contracts
13. Files necessary tax reports			X			66	66	8	13. Tax Regulations
14. Interviews and hires workers			X			62	67	2	14. Personnel Procedures
15. Decides on equipment and supplies purchase.				X	30	48	78	3	15. Money Management

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO NURSERY AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 60 PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		RELATED KNOWLEDGE REQUIREMENT
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
E. MANAGEMENT AND FINANCES (Continued)									
16. Keeps employee records			X		22	42	65	8	16. Record keeping
17. Studies and implements government regulations									17. Government Regulations
a. pesticide usage			X		40	21	62	5	a. Pesticide regulations
b. standards and grades		X			39	18	62	7	b. Standards and grades
c. OSHA standards			X		57	11	71	2	c. OSHA regulations
d. employee benefits			X		33	23	59	5	d. Employee benefits
e. zoning		X			2	19	21	10	e. Zoning regulations
f. environmental concerns		X			17	21	40	7	f. EPA regulations
Others (List)									

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO LANDSCAPING AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 23						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT									
1. Prepares soil and/or media				X	43	35	75	12	1. Soils and Plant Media
2. Sows seeds and grows seedlings		X			21	27	56	12	2. Seedling Culture
3. Transplants plants			X		30	39	75	8	3. Principles of Transplanting
4. Pots plants		X			22	22	27	16	4. Potting and Plant Culture
5. Makes pots	X					1		12	5. Pot Making Materials & Techniques
6. Reproduces plants vegetatively		X			26	13	44	17	6. Vegetative Propagation
7. Identifies and applies different fertilizers				X	22	45	83	9	7. Plant Nutrition
8. Irrigates plants				X	82	1	96		8. Irrigation and Irrigation Systems
9. Mixes and applies herbicides safely				X	39	44	83	4	9. Weed Identification & Control
10. Mixes and applies insecticides safely			X		35	35	57	9	10. Insect Identification & Control
11. Mixes and applies miticides safely		X			22	26	58	17	11. Mite Identification & Control
12. Mixes and applies fungicides safely			X		18	36	62	17	12. Disease Ident., Prevention & Control
13. Mixes and applies growth regulators safely		X			13	17	34	9	13. Growth Regulators
14. Selects and grows Horticultural plants		X			22	18	41	17	14. Plant Identification & Culture
15. Selects and grows lawns and turf		X			13	26	43	12	15. Turf Grass Identification and Culture
16. Sterilizes soil and/or media		X			13	17	35	17	16. Soil Sterilants
17. Mows lawn and turf			X		52	22	69	4	17. Lawn and Turf Maintenance
18. Prunes trees, shrubs and flowers			X		30	39	73	9	18. Pruning Methods and Plant Growth
19. Trains plants		X				30	31	20	19. Bonsai, Topiary
20. Corrects drainage problems			X			57	53	12	20. Soil Drainage

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO LANDSCAPING AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 23 — PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		RELATED KNOWLEDGE REQUIREMENT
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
A. PLANT GROWTH AND DEVELOPMENT (continued)									
21. Sets plants according to plan			X		57	17	58	12	21. Landscape Plan and Design
22. Prepares container plants		X			18	13	23	17	22. Container Plant Culture
23. Constructs and repairs growing facilities									23. Construction & Maint. of Facilities
a. greenhouse		X				27	26	4	a. greenhouse materials & supplies
b. mist system		X				32	30	4	b. Mist system materials & supplies
c. bench		X				32	26	4	c. Bench materials and supplies
Others(List)									
B. EQUIPMENT USAGE AND MAINTENANCE									
1. Operates tractor and attachments			X		35	26	57	9	1. Operation & Care of Tractor & Attach.
2. Uses power sprayer			X		34	22	66	12	2. Operation & Care of Power Sprayer
3. Uses portable power tools			X		38	26	66	12	3. Operation & Care of Port. Power Tools
4. Operates small truck				X	83	8	91	4	4. Operation & Care of Small Truck
5. Uses sterilizing equipment	X				12	9	22	12	5. Operation & Care of Sterilizing Equip.
6. Uses concrete mixer	X				4	9	13	4	6. Operation & Care of Concrete Mixer
7. Uses shredder		X			8	22	23	12	7. Operation & Care of Shredder
8. Uses chain saw			X		17	43	61		8. Operation & Care of Chain Saw
9. Uses mower			X		56	17	82		9. Operation & Care of Mower
10. Uses proportioner	X				9	4	13	4	10. Operation & Care of Proportioner
11. Uses hand tools				X	87		83		11. Uses & Care of Hand Tools
12. Uses tree planting equipment		X			27	17	49	4	12. Operation & Care-Tree Plant. Equip.

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO LANDSCAPING AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 23								RELATED KNOWLEDGE REQUIREMENT
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
B. EQUIPMENT USAGE AND MAINTENANCE (continued)									
13. Uses small gas engines			X		47	4	52	12	13. Operation & Care of Small Engines
Others (List)									
Equipment maintenance									
14. Services and maintains equipment			X		47	26	79	4	14. Servicing & Maintenance of Equip.
15. Repairs broken equipment and machinery			X		26	31	43	4	15. Repair Parts/Disassembly
16. Reconditions hand tools		X			17	4	26	12	16. Hand Tools Reconditioning
Others (List)									
C. PROCESS, MARKET AND DISTRIBUTE COMMODITIES									
1. Prepares flowers, foliage shrubs for market	X					4	4	4	1. Plant Material Handling
2. Prepares floral pieces for all occasions							4	12	2. Floral Arrangement
3. Takes orders and arranges for delivery								17	3. Sales and Service
4. Grades flowers and foliage								17	4. Grades and Standards
5. Stores horticultural supplies	X						4	4	5. Stock Control
6. Stores flowers and foliage							4	17	6. Post Harvest Handling

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO LANDSCAPING AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 23						RELATED KNOWLEDGE REQUIREMENT	
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK	
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important
C. PROCESS, MARKET AND DISTRIBUTE COMMODITIES (Continued)								
7. Sells flowers, floral arrangement and prod.	X				4	4	4	12
8. Advises customers on product usage	X				4	9	13	12
9. Advises customers on care of plants	X				4	17	22	12
10. Displays flower and foliage								4
Others (List)								
D. TECHNOLOGY AND RESEARCH								
1. Carries out plant varietal trials	X					14	14	4
2. Carries out agricultural chemical trials								4
3. Adapts equipment to peculiar needs	X					8	8	12
4. Carries out time-cost studies	X				4	12	17	12
5. Identifies problems requiring research						22	17	12
6. Keeps records of experiments and trials	X					22	22	12
7. Writes reports	X				8	8	12	12
8. Diagrams and designs facilities	X					9	9	4
9. Reads and interprets research findings	X					12	12	9

KNOWLEDGE
7. Salesmanship
8. Product Usage
9. Plant Culture
10. Display Techniques
1. Experimental Procedures/Genetics
2. Experimental Procedures/Chemistry
3. Mechanical Engineering
4. Cost Accounting
5. Observation & Identification of Prod.
6. Data & Records
7. Report Writing
8. Architectural Drawing
9. Interpretation of Data

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO LANDSCAPING AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 23 — PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		RELATED KNOWLEDGE REQUIREMENT
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
D. TECHNOLOGY AND RESEARCH (Continued)									
10. Reads and interprets technical manuals	X					12	12	4	10. Technical Vocabulary
11. Breeds plants	X				4	9	4	17	11. Genetics
12. Controls environment in which plants grow	X				4	8	17	12	12. Environmental Aspects of Plants
Others (List)									
E. MANAGEMENT AND FINANCES									
1. Promotes good human relations			X		75	4	75		1. Human Relations
2. Develops operational plans			X		40	17	62	9	2. Planning
3. Develops budget		X			9	36	53	9	3. Budgeting
4. Determines status of operations			X		45	17	62	9	4. Evaluation
5. Prepares financial statements		X			9	36	48	4	5. Accounting
6. Studies market trends	X				4	13	17	4	6. Market Research
7. Promotes new markets and outlets		X			20	9	31	12	7. Marketing
8. Communicates with outlets		X			22	9	32	12	8. Sales and Services
9. Arranges for loans	X				4	13	17	17	9. Loans and Loan Procedures
10. Prepares and/or interprets contracts		X			22	17	41	17	10. Business Law
11. Advertises products	X					4	4	17	11. Advertising
12. Prepares bids		X			18	13	41	17	12. Contracts
13. Files necessary tax reports		X				32	36	17	13. Tax Regulations
14. Interviews and hires workers			X		•	67	67	9	14. Personnel Procedures
15. Decides on equipment and supplies purchase.			X		9	45	67	9	15. Money Management

COMPOSITE SUMMARY OF JOB TASKS AND KNOWLEDGE REQUIREMENTS OF THE ORNAMENTAL HORTICULTURE INDUSTRY RELATED TO LANDSCAPING AND ALLIED SERVICES

JOB TASKS OR OPERATION	PERFORMANCE AND FREQUENCY OF JOB TASKS Tot. No. of Respondents 23						RELATED KNOWLEDGE REQUIREMENT		
	PERCENTAGE INDICATING WORKERS PERFORMING TASKS				PERCENTAGE INDICATING FREQUENCY OF PERFORMANCE		PERCENTAGE INDICATING THE IMPORTANCE OF THE TASK		
	0-25%	26-50%	51-75%	76-100%	Daily Weekly	2/mon. Monthly As Needed	Important	Not Important	KNOWLEDGE
E. MANAGEMENT AND FINANCES (Continued)									
16. Keeps employee records			X		26	26	57	9	16. Record keeping
17. Studies and implements government regulations									17. Government Regulations
a. pesticide usage			X		45	17	71	4	a. Pesticide regulations
b. standards and grades	X					9	9	17	b. Standards and grades
c. OSHA standards			X		53	9	62	9	c. OSHA regulations
d. employee benefits			X		36	17	57	12	d. Employee benefits
e. zoning		X			27		27	17	e. Zoning regulations
f. environmental concerns		X			36	9	36	4	f. EPA regulations
Others (List)									

Specific Findings of the Survey in Ornamental Horticulture

The following focuses attention on the specific findings in the survey of job tasks and knowledge requirements in the ornamental horticulture industry as related to: (1) nursery and allied services and (2) landscaping and allied services.

A. Nursery and Allied Services

Nursery and Allied Services included nurseries, greenhouses, garden shops, and flower shops. The reactions of sixty respondents are included.

1. Preparing of soil and/or media, sowing and growing seedlings, transplanting, applying fertilizer, irrigating plants, applying herbicides, insecticides, miticides and fungicides, and pruning were ranked as important by the majority of the respondents.

2. Operating machinery and using hand tools were considered very important. Servicing and maintaining equipment and reconditioning of hand tools were considered important.

3. Preparing flowers foliage and shrubs for market; taking orders; storing horticultural supplies and advising customers on care of plants were ranked very important.

4. Identifying problems requiring research, controlling environment in which plants grow and keeping records of experiments and trials were considered somewhat important.

5. Management activities that were ranked very important by the respondents included promoting good human relations, developing operational plans, determining status of operations, and deciding on equipment and supplies purchase. Other considered important included developing a budget, preparing financial statements, studying market trends, promoting new markets and communicating with outlets.

6. Adhering to government regulations concerning safety, pesticide usage, and employee benefits were ranked important.

B. Landscaping and Allied Services

Landscaping and Allied Services included landscaping and groundskeeping. A total of 23 respondents were included in the survey.

1. Preparing soil and/or media, applying fertilizers, irrigating plants, and applying herbicides were considered very important by landscaping and groundskeeping personnel. Ranked as important were transplanting plants, applying insecticides and miticides, mowing lawns and turf, pruning, correcting drainage and setting plants according to plan.

2. Equipment usage such as operating a tractor and attachments, power sprayers, protable tools, chain saws, mowers and hand tools were listed as important.

3. Servicing, repairing and maintaining equipment are important tasks.

4. Management activities considered important included promoting good human relations, developing operations plans, determining status of operations, interviewing and hiring workers, and deciding on equipment and supply purchases.

5. Adhering to government regulations in pesticide usage, safety (OSHA standards) and employee benefits was indicated as important.

C. Further Clarification of Survey Data and Findings in Ornamental Horticulture

An in-depth analysis of certain items in the Composite Summaries of Job Tasks and Knowledge Requirements of Ornamental Horticulture Related to Nursery and Allied Services and Landscaping and Allied Services was deemed necessary for further clarification.

The composite summary for nursery and allied services included responses from 17 nurseries, 12 garden shops, 16 flower shops and 15 flower growers; while the composite summary for landscaping and allied services represents responses from 11 landscaping firms and 12 groundskeeping representatives.

The percentages reported in the two composite summaries mentioned above are combined averages and do not necessarily reflect individual averages of various segments in the composite. For example the percentages reported by nursery operators and flower growers for such tasks as preparing soil and/or media, sowing seeds and growing seedlings, transplanting, fertilizing, irrigating plants and applying pesticides are much higher when taken as individual segments than as a composite. This is true also for the composite summary for landscaping and allied services but not as pronounced because only two segments of workers were involved.

Landscaping and allied services respondents indicated performing tasks using specialized equipment. Equipment such as shredder, chain saw, mower, tractor and attachments and portable power tools are indicative of the nature of operations performed by landscaping and groundskeeping personnel as contrasted to nursery workers and flower growers who deal more with floral products and do not require specialized equipment such as those listed above.

Although the composite summary for nursery and allied services shows that only 34% reported preparing floral pieces for all occasions, this does not mean that this task is not an important one. In fact 100% of the flower shop respondents indicated performing this task.

Both nursery and landscaping respondents indicated overall low percentages in the various tasks listed in the area of technology and research. Although there is a heavy reliance on the various agricultural experiment stations of the University of Hawaii to conduct research, some private research is still being carried on. These research activities may be in the form of simple trials to meet peculiar needs of individuals or firms.

APPENDIX

Names of firms and individuals participating in the Agriculture Technology survey:

Island of Kauai
- A & J Ranch
- Big Save Incorporated, Kauai
- Brewer Chemical Company, Kauai Branch
- Hawaii Fruit Preserving Company, Ltd.
- Kauai Growers Exchange, Inc.
- Kauai Poultry Farm
- Kauai Producers, Ltd.
- Kekaha Sugar Company
- Meadow Gold Dairies, Kauai Branch
- M. Kaneshiro Hog Farm
- Medeiros Farm
- Nonaka Farms
- Northrup King & Co. Pride Division
- Pioneer Hi-Bred International, Inc.
- S & F Takahashi Farm
- Taro Dell Farm
- The Goo Farm
- I. Javellana Farm
- T. T. Kuramoto & Co.
- T. Yamamoto Farm

Island of Oahu
- Albers Milling Company
- Cackle Fresh Egg Farm, Inc.
- Dole Corporation, Wahiawa Plantation
- Fish Farms Hawaii, Laie
- Green Growers, Inc.
- Green Valley Na Mahi Ai
- Hawaii Meat Co., Ltd.
- Hawaii Milling Supplies
- Kahuku Agricultural Company
- Kahuku Farms
- Kualoa Ranch
- Lowe, Inc.
- Meadow Gold Farms
- Meadow Gold Dairy Products
- M. Nakayama Farm
- Pacific Poultry Co., Ltd.
- Rancho Produce
- Waialua Agricultural Company
- Waipuna Trading Co., Inc.
- Wallace Tomei Piggery

Names of firms and individuals participating in the Agriculture Technology survey: (Continued)

Island of Maui
- A. DeCoite Packing House, Inc.
- Chicken Farm
- Haleakala Dairy, Inc.
- Hawaiian Commercial & Sugar Company
- Maui Farmers Cooperative Exchange
- Maui Hog Producers
- M. Agena
- M. Uradomo Farm
- Princess Orchards, Inc.
- RJR Foods, Inc.
- Trojan Seed Company

Island of Hawaii
- Herbert M. Imai
- Jay's Hog Farm & Slaughter
- Kealakekua Ranch
- Kona Poultry
- K. Oue, Ltd.
- McCandless Ranch
- Masao Sunada
- Melvin Kunitake
- Richard Matsumoto Farm
- SIT Farms
- Sugai Nursery
- Sunset Cooperative
- Toshio Yoshizaki
- YRV Farms, Inc.

Names of firms and individuals participating in the Ornamental Horticulture survey:

Island of Oahu
- Aiea Florist
- Benjamin Okabe
- Benjamin T. Kodama
- C. M. Okura Enterprises
- Department of Education Nursery
- Ebisuya Florist
- Elizabeth Florist, Inc.
- Evergreen Nursery, Inc.
- Foster Garden
- Garden City, Inc.
- Garden Village
- Green Thumb, Inc.
- Hilton Hawaiian Village Hotel
- Honohona Unlimited, Inc.
- Honolulu Zoo
- Hoonani Landscaping
- Kailua Florist
- Kawahara Nursery & Landscaping Co., Ltd.
- Kimura Florist
- Leeward Florist
- Makiki Nursery
- Makalena Golf Course
- Mililani Town Nursery
- Oka Nursery
- Park View-GEM Garden Shop
- Pearl City Florist
- Rusty's Florist
- S. Nii Nursery
- Stanley Ito Florist
- Star Garden Supply
- University of Hawaii, Facilities Management
- Waiau Garden & Home Supply
- Waipahu Garden Shop
- Waipahu Florist
- Walter Honda
- Walter S. Okabe
- Wayne N. Tsue
- T. Abe Rose Farm
- T. Kubota Nursery, Inc.

Names of firms and individuals participating in the Ornamental Horticulture survey: (Continued)

Island of Maui
- Discount Garden Shop
- Ed's Garden and Floral Supplies
- Hawaiian Foliage and Landscape, Inc.
- Hitoshi Urada
- John Umeno
- Kahana Sunset
- Kahului Florist, Inc.
- Kapalua Nursery
- Kawabata Nursery
- Masato Kawamura
- Maui Garden & Hardware
- Shigeo Moida
- Ted's Landscaping Service
- Terry's Nursery
- Toshio Watanabe
- Yano Landscaping, Inc.
- Wailuku Florist

Island of Hawaii
- Big Island Plant & Foliage
- Ebesu's Ltd.
- Fred's Nursery
- Garden Exchange, Ltd.
- Hale Nui Flowers
- Hawaiiana Investment Co.
- Hilo Farmers Exchange, Ltd.
- Hilo Puna Nani Florist
- H. Eunice Nursery, Inc.
- H. Mukai Florist & Nursery
- Hirose Nursery, Inc.
- Island Orchids, Inc.
- Island Supply, Inc.
- Kawamata Farm
- Kohala Nursery, Inc.
- Matsumoto Nursery
- Mauna Kea Beach Hotel
- Orchids Pacifica, Inc.
- Richard Tanaka Nursery
- Sea Mountain - Ninole Golf Course
- The Orchidarium

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